What You Need To Know About™

Lung Cancer

NATIONAL INSTITUTES OF HEALTH
National Cancer Institute

This booklet is about lung cancer. If you have questions, call the Cancer Information Service to learn more about this disease. The staff can talk with you in English or Spanish.

The number is 1–800–422–6237 (1–800–4–CANCER). The number for deaf and hard of hearing callers with TTY equipment is 1–800–332–8615. The call is free.

Este folleto es acerca del cáncer del pulmón. Si tiene preguntas, llame al Servicio de Información sobre el Cáncer para conocer más acerca de esta enfermedad. Este servicio tiene personal que habla español.

El número a llamar es el 1–800–422–6237 (1–800–4–CANCER). Personas con dificultades de audición con equipo TTY pueden llamar al 1–800–332–8615. La llamada es gratis.

Contents

U.S. DEPARTMENT OF HEALTH AND
HUMAN SERVICES
Public Health Service
National Institutes of Health

What You Need To Know About™ Lung Cancer

The diagnosis of lung cancer brings with it many questions and a need for clear, understandable answers. We hope this National Cancer Institute (NCI) booklet will help. It provides information about some causes and ways to prevent lung cancer, and it describes the symptoms, detection, diagnosis, and treatment of this disease. Having this important information can make it easier for patients and their families to handle the challenges they face.

Cancer research has led to progress against lung cancer–and our knowledge is increasing. Researchers continue to look for better ways to prevent, detect, diagnose, and treat lung cancer. The Cancer Information Service and the other NCI resources listed under "National Cancer Institute Information Resources" can provide the latest, most accurate information on lung cancer. Publications mentioned in this book and others are available from the Cancer Information Service at 1–800–4–CANCER. Many NCI publications are also available on the Internet at the Web sites listed in the "National Cancer Institute Information Resources" section at the end of this booklet.

Understanding the Cancer Process

All types of cancer develop in our cells, the body's basic unit of life. To understand cancer, it is helpful to know how normal cells become cancerous.

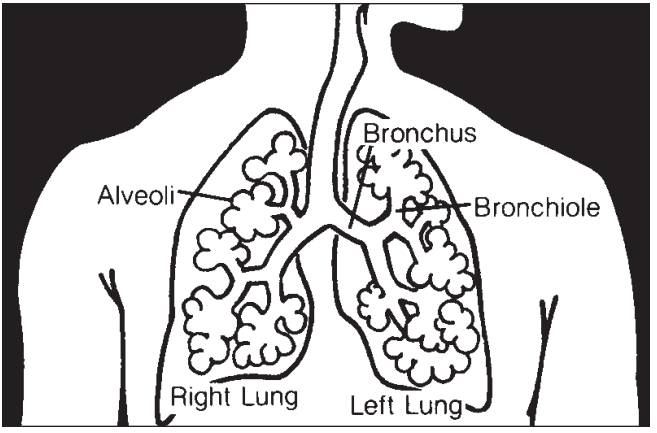
The body is made up of many types of cells. Normally, cells grow, divide, and produce more cells as needed to keep the body healthy and functioning properly. Sometimes, however, the process goes astray–cells keep dividing when new cells are not needed. The mass of extra cells forms a growth or tumor. Tumors can be benign or malignant.

Benign tumors are not cancer. They often can be removed and, in most cases, they do not come back. Cells in benign tumors do not spread to other parts of the body. Most important, benign tumors are rarely a threat to life.

Malignant tumors are cancer. Cells in malignant tumors are abnormal and divide without control or order. These cancer cells can invade and destroy the tissue around them. Cancer cells can also break away from a malignant tumor and enter the bloodstream or lymphatic system (the tissues and organs that produce, store, and carry white blood cells that fight infection and other diseases). This process, called metastasis, is how cancer spreads from the original (primary) tumor to form new (secondary) tumors in other parts of the body.

The Lungs

The lungs, a pair of sponge-like, cone-shaped organs, are part of the respiratory system. The right lung has three sections, called lobes; it is a little larger than the left lung, which has two lobes. When we breathe in, the lungs take in oxygen, which our cells



need to live and carry out their normal functions. When we breathe out, the lungs get rid of carbon dioxide, which is a waste product of the body's cells.

Understanding Lung Cancer

Cancers that begin in the lungs are divided into two major types, nonsmall cell lung cancer and small cell lung cancer, depending on how the cells look under a microscope. Each type of lung cancer grows and spreads in different ways and is treated differently.

Nonsmall cell lung cancer is more common than small cell lung cancer, and it generally grows and spreads more slowly. There are three main types of nonsmall cell lung cancer. They are named for the type of cells in which the cancer develops: squamous cell carcinoma (also called epidermoid carcinoma), adenocarcinoma, and large cell carcinoma.

Small cell lung cancer, sometimes called oat cell cancer, is less common than nonsmall cell lung cancer. This type of lung cancer grows more quickly and is more likely to spread to other organs in the body.

Cancers that begin in the lungs are divided into two major types, nonsmall cell lung cancer and small cell lung cancer, depending on how the cells look under a microscope. Each type of lung cancer grows and spreads in different ways and is treated differently.

Lung Cancer: Who's at Risk?

Researchers have discovered several causes of lung cancer–most are related to the use of tobacco.

- **Cigarettes.** Smoking cigarettes causes lung cancer. Harmful substances, called carcinogens, in tobacco damage the cells in the lungs. Over time, the damaged cells may become cancerous. The likelihood that a smoker will develop lung cancer is affected by the age at which smoking began, how long the person has smoked, the number of cigarettes smoked per day, and how deeply the smoker inhales. Stopping smoking greatly reduces a person's risk for developing lung cancer.
- **Cigars and Pipes.** Cigar and pipe smokers have a higher risk of lung cancer than nonsmokers. The number of years a person smokes, the number of pipes or cigars smoked per day, and how deeply the person inhales all affect the risk of developing lung cancer. Even cigar and pipe smokers who do not inhale are at increased risk for lung, mouth, and other types of cancer.
- **Environmental Tobacco Smoke.** The chance of developing lung cancer is increased by exposure to environmental tobacco smoke (ETS)–the smoke in the air when someone else smokes. Exposure to ETS, or secondhand smoke, is called involuntary or passive smoking.

- **Radon.** Radon is an invisible, odorless, and tasteless radioactive gas that occurs naturally in soil and rocks. It can cause damage to the lungs that may lead to lung cancer. People who work in mines may be exposed to radon and, in some parts of the country, radon is found in houses. Smoking increases the risk of lung cancer even more for those already at risk because of exposure to radon. A kit available at most hardware stores allows homeowners to measure radon levels in their homes. The home radon test is relatively easy to use and inexpensive. Once a radon problem is corrected, the hazard is gone for good.
- **Asbestos.** Asbestos is the name of a group of minerals that occur naturally as fibers and are used in certain industries. Asbestos fibers tend to break easily into particles that can float in the air and stick to clothes. When the particles are inhaled, they can lodge in the lungs, damaging cells and increasing the risk for lung cancer. Studies have shown that workers who have been exposed to large amounts of asbestos have a risk of developing lung cancer that is 3 to 4 times greater than that for workers who have not been exposed to asbestos. This exposure has been observed in such industries as shipbuilding, asbestos mining and manufacturing, insulation work, and brake repair. The risk of lung cancer is even higher among asbestos workers who also smoke. Asbestos workers should use the protective equipment provided by their employers and follow recommended work practices and safety procedures.
- **Pollution.** Researchers have found a link between lung cancer and exposure to certain air pollutants, such as by-products of the combustion of diesel and other fossil fuels. However, this relationship has not been clearly defined, and more research is being done.

- **Lung Diseases.** Certain lung diseases, such as tuberculosis (TB), increase a person's chance of developing lung cancer. Lung cancer tends to develop in areas of the lung that are scarred from TB.
- **Personal History.** A person who has had lung cancer once is more likely to develop a second lung cancer compared with a person who has never had lung cancer. Quitting smoking after lung cancer is diagnosed may prevent the development of a second lung cancer.

Researchers continue to study the causes of lung cancer and to search for ways to prevent it. We already know that the best way to prevent lung cancer is to quit (or never start) smoking. The sooner a person quits smoking the better. Even if you have been smoking for many years it's never too late to benefit from quitting.

> The best way to prevent lung cancer is to quit, or never start, smoking.

Recognizing Symptoms

Common signs and symptoms of lung cancer include:

- A cough that doesn't go away and gets worse over time
- Constant chest pain
- Coughing up blood
- Shortness of breath, wheezing, or hoarseness
- Repeated problems with pneumonia or bronchitis
- Swelling of the neck and face
- Loss of appetite or weight loss
- Fatigue

These symptoms may be caused by lung cancer or by other conditions. It is important to check with a doctor.

Diagnosing Lung Cancer

To help find the cause of symptoms, the doctor evaluates a person's medical history, smoking history, exposure to environmental and occupational substances, and family history of cancer. The doctor also performs a physical exam and may order a chest x-ray and other tests. If lung cancer is suspected, sputum cytology (the microscopic examination of cells obtained from a deep-cough sample of mucus in the lungs) is a simple test that may be useful in detecting lung cancer. To confirm the presence of lung cancer, the doctor must examine tissue from the lung. A biopsy–the removal of a small sample of tissue for examination under a microscope by a pathologist–can show whether a person has cancer. A number of procedures may be used to obtain this tissue:

- **Bronchoscopy.** The doctor puts a bronchoscope (a thin, lighted tube) into the mouth or nose and down through the windpipe to look into the breathing passages. Through this tube, the doctor can collect cells or small samples of tissue.
- **Needle aspiration.** A needle is inserted through the chest into the tumor to remove a sample of tissue.
- **Thoracentesis.** Using a needle, the doctor removes a sample of the fluid that surrounds the lungs to check for cancer cells.
- **Thoracotomy.** Surgery to open the chest is sometimes needed to diagnose lung cancer. This procedure is a major operation performed in a hospital.

Staging the Disease

If the diagnosis is cancer, the doctor will want to learn the stage (or extent) of the disease. Staging is done to find out whether the cancer has spread and, if so, to what parts of the body. Lung cancer often spreads to the brain or bones. Knowing the stage of the disease helps the doctor plan treatment. Some tests used to determine whether the cancer has spread include:

- **CAT (or CT) scan** (computed tomography). A computer linked to an x-ray machine creates a series of detailed pictures of areas inside the body.
- **MRI** (magnetic resonance imaging). A powerful magnet linked to a computer makes detailed pictures of areas inside the body.
- **Radionuclide scanning.** Scanning can show whether cancer has spread to other organs, such as the liver. The patient swallows or receives an injection of a mildly radioactive substance. A machine (scanner) measures and records the level of radioactivity in certain organs to reveal abnormal areas.
- **Bone scan.** A bone scan, one type of radionuclide scanning, can show whether cancer has spread to the bones. A small amount of radioactive substance is injected into a vein. It travels through the bloodstream and collects in areas of abnormal bone growth. An instrument called a scanner measures the radioactivity levels in these areas and records them on x-ray film.
- **Mediastinoscopy/Mediastinotomy.** A mediastinoscopy can help show whether the cancer has spread to the lymph nodes in the chest. Using a lighted viewing instrument, called a scope, the doctor examines the center of the chest (mediastinum) and nearby lymph nodes. In mediastinoscopy, the scope is inserted through a

small incision in the neck; in mediastinotomy, the incision is made in the chest. In either procedure, the scope is also used to remove a tissue sample. The patient receives a general anesthetic.

Treatment for Lung Cancer

Treatment depends on a number of factors, including the type of lung cancer (nonsmall or small cell lung cancer), the size, location, and extent of the tumor, and the general health of the patient. Many different treatments and combinations of treatments may be used to control lung cancer, and/or to improve quality of life by reducing symptoms.

- **Surgery** is an operation to remove the cancer. The type of surgery a doctor performs depends on the location of the tumor in the lung. An operation to remove only a small part of the lung is called a segmental or wedge resection. When the surgeon removes an entire lobe of the lung, the procedure is called a lobectomy. Pneumonectomy is the removal of an entire lung. Some tumors are inoperable (cannot be removed by surgery) because of the size or location, and some patients cannot have surgery for other medical reasons.
- **Chemotherapy** is the use of anticancer drugs to kill cancer cells throughout the body. Even after cancer has been removed from the lung, cancer cells may still be present in nearby tissue or elsewhere in the body. Chemotherapy may be used to control cancer growth or to relieve symptoms. Most anticancer drugs are given by injection directly into a vein (IV) or by means of a catheter, a thin tube that is placed into a large vein and remains there as long as it is needed. Some anticancer drugs are given in the form of a pill.

- **Radiation therapy,** also called radiotherapy, involves the use of high-energy rays to kill cancer cells. Radiation therapy is directed to a limited area and affects the cancer cells only in that area. Radiation therapy may be used before surgery to shrink a tumor, or after surgery to destroy any cancer cells that remain in the treated area. Doctors also use radiation therapy, often combined with chemotherapy, as primary treatment instead of surgery. Radiation therapy may also be used to relieve symptoms such as shortness of breath. Radiation for the treatment of lung cancer most often comes from a machine (external radiation). The radiation can also come from an implant (a small container of radioactive material) placed directly into or near the tumor (internal radiation).
- **Photodynamic therapy (PDT),** a type of laser therapy, involves the use of a special chemical that is injected into the bloodstream and absorbed by cells all over the body. The chemical rapidly leaves normal cells but remains in cancer cells for a longer time. A laser light aimed at the cancer activates the chemical, which then kills the cancer cells that have absorbed it. Photodynamic therapy may be used to reduce symptoms of lung cancer–for example, to control bleeding or to relieve breathing problems due to blocked airways when the cancer cannot be removed through surgery. Photodynamic therapy may also be used to treat very small tumors in patients for whom the usual treatments for lung cancer are not appropriate.

Clinical trials (research studies) to evaluate new ways to treat cancer are an option for many lung cancer patients. In some studies, all patients receive the new treatment. In others, doctors compare different therapies by giving the new treatment to one group of patients and the usual (standard) therapy to another group.

Through research, doctors are exploring new and possibly more effective ways to treat lung cancer. More information about treatment studies can be found in the NCI publication *Taking Part in Clinical Trials: What Cancer Patients Need To Know*. PDQ®, NCI's cancer information database, contains detailed information about ongoing studies for lung cancer. NCI also has a Web site at http://cancertrials.nci.nih.gov that provides detailed information about ongoing studies for lung cancer for patients, health professionals, and the public.

The NCI's CancerNet™ Web site provides information from numerous NCI sources, including PDQ®, NCI's cancer information database. PDQ contains current information on cancer prevention, screening, treatment, supportive care, and ongoing clinical trials. CancerNet also contains CANCERLIT®, a database of citations and abstracts on cancer topics from scientific literature. CancerNet can be accessed at **http://cancernet.nci.nih.gov** on the Internet.

Treating Nonsmall Cell Lung Cancer

Patients with nonsmall cell lung cancer may be treated in several ways. The choice of treatment depends mainly on the size, location, and extent of the tumor. Surgery is the most common way to treat this type of lung cancer. Cryosurgery, a treatment that freezes and destroys cancer tissue, may be used to control symptoms in the later stages of nonsmall cell lung cancer. Radiation therapy and chemotherapy may also be used to slow the progress of the disease and to manage symptoms.

Treating Small Cell Lung Cancer

Small cell lung cancer spreads quickly. In many cases, cancer cells have already spread to other parts of the body when the disease is diagnosed. In order to reach cancer cells throughout the body, doctors almost always use chemotherapy. Treatment may also include radiation therapy aimed at the tumor in the lung or tumors in other parts of the body (such as in the brain). Some patients have radiation therapy to the brain even though no cancer is found there. This treatment, called prophylactic cranial irradiation (PCI), is given to prevent tumors from forming in the brain. Surgery is part of the treatment plan for a small number of patients with small cell lung cancer.

Side Effects

The side effects of cancer treatment depend on the type of treatment and may be different for each person. Side effects are often only temporary. Doctors and nurses can explain the possible side effects of treatment, and they can suggest ways to help relieve symptoms that may occur during and after treatment.

- **Surgery** for lung cancer is a major operation. After lung surgery, air and fluid tend to collect in the chest. Patients often need help turning over, coughing, and breathing deeply. These activities are important for recovery because they help expand the remaining lung tissue and get rid of excess air and fluid. Pain or weakness in the chest and the arm and shortness of breath are common side effects of lung cancer surgery. Patients may need several weeks or months to regain their energy and strength.
- **Chemotherapy** affects normal as well as cancerous cells. Side effects depend largely on the specific

drugs and the dose (amount of drug given). Common side effects of chemotherapy include nausea and vomiting, hair loss, mouth sores, and fatigue.

- **Radiation therapy,** like chemotherapy, affects normal as well as cancerous cells. Side effects of radiation therapy depend mainly on the part of the body that is treated and the treatment dose. Common side effects of radiation therapy are a dry, sore throat; difficulty swallowing; fatigue; skin changes at the site of treatment; and loss of appetite. Patients receiving radiation to the brain may have headaches, skin changes, fatigue, nausea and vomiting, hair loss, or problems with memory and thought processes.
- **Photodynamic therapy** makes the skin and eyes sensitive to light for 6 weeks or more after treatment. Patients are advised to avoid direct sunlight and bright indoor light for at least 6 weeks. If patients *must* go outdoors, they need to wear protective clothing, including sunglasses. Other temporary side effects of PDT may include coughing, trouble swallowing, and painful breathing or shortness of breath. Patients should talk with their doctor about what to do if the skin becomes blistered, red, or swollen.

Today, because of what has been learned in clinical trials, doctors are able to control, lessen, or avoid many of the side effects of treatment. Several useful NCI booklets, including *Chemotherapy and You, Radiation Therapy and You,* and *Eating Hints for Cancer Patients,* suggest ways to cope with the side effects of cancer treatment.

Doctors and nurses can explain the possible side effects of treatment, and they can suggest ways to help relieve symptoms that may occur during and after treatment.

The Importance of Followup Care

Followup care after treatment for lung cancer is very important. Regular checkups ensure that changes in health are noticed, and if the cancer returns or a new cancer develops, it can be treated as soon as possible. Checkups may include physical exams, chest x-rays, or lab tests. Between scheduled appointments, people who have had lung cancer should report any health problems to their doctor as soon as they appear.

Providing Emotional Support

Living with a serious disease, such as cancer, is challenging. Apart from having to cope with the physical and medical challenges, people with cancer face many worries, feelings, and concerns that can make life difficult. They may find they need help coping with the emotional as well as the practical aspects of their disease. In fact, attention to the emotional and psychological burden of having cancer is often part of a patient's treatment plan. The support of the health care team (doctors, nurses, social workers, and others), support groups, and patient-to-patient networks can help people feel less alone and upset, and improve the quality of their lives. Cancer support groups provide a safe environment where cancer patients can talk about living with cancer with others who may be having similar experiences. Patients may want to speak to a member of their health care team about finding a support group. Many also find useful information in NCI fact sheets and booklets, including *Taking Time* and *Facing Forward*.

National Cancer Institute Information Resources

You may want more information for yourself, your family, and your doctor. The following National Cancer Institute (NCI) services are available to help you.

Telephone

Cancer Information Service (CIS)

Provides accurate, up-to-date information on cancer to patients and their families, health professionals, and the general public. Information specialists translate the latest scientific information into understandable language and respond in English, Spanish, or on TTY equipment.

Toll-free: 1–800–4–CANCER (1–800–422–6237)

TTY (for deaf and hard of hearing callers): 1–800–332–8615

Internet

These Web sites may be useful:

http://www.nci.nih.gov

NCI's primary Web site; contains information about the Institute and its programs.

http://cancertrials.nci.nih.gov

cancerTrials™; NCI's comprehensive clinical trials information center for patients, health professionals, and the public. Includes information on understanding trials, deciding whether to participate in trials, finding specific trials, plus research news and other resources.

http://cancernet.nci.ih.gov

CancerNet™; contains material for health professionals, patients, and the public, including information from PDQ® about cancer treatment, screening, prevention, supportive care, and clinical trials; and CANCERLIT®, a bibliographic database.

E-mail

CancerMail

Includes NCI information about cancer treatment, screening, prevention, and supportive care. To obtain a contents list, send e-mail to cancermail@icicc.nci.nih.gov with the word "help" in the body of the message.

Fax

CancerFax®

Includes NCI information about cancer treatment, screening, prevention, and supportive care. To obtain a contents list, dial 301–402–5874 from a fax machine hand set and follow the recorded instructions.

Questions for Your Doctor

This booklet is designed to help you get information you need from your doctor, so that you can make informed decisions about your health care. In addition, asking your doctor the following questions will help you further understand your condition. To help you remember what the doctor says, you may take notes or ask whether you may use a tape recorder. Some people also want to have a family member or friend with them when they talk to the doctor–to take part in the discussion, to take notes, or just to listen.

Diagnosis

- What tests can diagnose lung cancer? Are they painful?
- How soon after the tests will I learn the results?
- What type of lung cancer do I have?

Treatment

- What treatments are recommended for me?
- What clinical trials are appropriate for my type of cancer?
- Will I need to be in the hospital to receive my treatment? For how long?
- How might my normal activities change during my treatment?

Side Effects

- What side effects should I expect? How long will they last?
- What side effects should I report? Whom should I call?

Followup

- After treatment, how often do I need to be checked? What type of followup care should I have?
- Will I eventually be able to resume my normal activities?

The Health Care Team

- Who will be involved with my treatment and rehabilitation? What is the role of each member of the health care team in my care?
- What has been your experience in caring for patients with lung cancer?

Resources

- Are there support groups in the area with people I can talk to?
- Are there organizations where I can get more information about cancer, specifically lung cancer?

The National Cancer Act, passed by Congress in 1971, made research a national priority. Since that time, the National Cancer Institute (NCI), the lead Federal agency for cancer research, has collaborated with top researchers and facilities across the country to conduct innovative research leading to progress in cancer prevention, detection, diagnosis, and treatment. These efforts have resulted in a decrease in the overall cancer death rate, and have helped improve and extend the lives of millions of Americans.

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P026